

WHAT IS CLAIMED IS:

1. A method for generating a spectrally shaped digital dither signal in a digital signal processing circuit, comprising the steps of:

5 (1) generating a series of numbers having random characteristics and filtering said series of numbers thereby generating a digital data stream representing a spectrally shaped dither signal; and

(2) adding said data stream to a series of signal values processed by the digital signal processing circuit, thereby reducing idle tone generation.

2. The method of claim 1 wherein said series of numbers having random characteristics are interpreted in two's complement format during at least step (2).

3 The method of claim 1 wherein said filtering step uses a filter with high-pass characteristics.

4. The method of claim 3 wherein said spectrally shaped dither signal represented by said data stream is attenuated at low frequencies with its energy concentrated in a band above 20 kHz.

5. The method of claim 4 wherein said spectrally shaped dither signal represented by said data stream has its energy concentrated in a band above 40 kHz.

6. The method of claim 3 wherein step (1) comprises processing said series of numbers having random characteristics in two's complement format.

7. The method of claim 1 wherein step (2) is performed selectively when said series of signal values represents a signal amplitude below a predetermined threshold.

5           8. The method of claim 1 wherein step (1) comprises using a pseudo-random number generator to generate said series of numbers having random characteristics.

10           9. The method of claim 8 wherein said pseudo-random number generator comprises a linear feedback shift register.

10           10. The method of claim 1 wherein said digital signal processing circuit is a digital modulator circuit.

15           11. The method of claim 10 wherein said digital modulator circuit is part of a cable television receiver.

12. An apparatus for generating a spectrally shaped digital dither signal in a digital signal processing circuit, comprising:

20           number generating means for generating a series of numbers having random characteristics;

          filter means connected to said number generating means for processing said series of numbers through a digital filter to produce a digital data stream representing a spectrally shaped signal; and

25           dithering means connected to said filter means for receiving said digital data stream and adding said data stream to a series of signal values processed by the digital signal processing circuit, thereby reducing idle tone generation.

30           13. The apparatus of claim 12 wherein said filter means and said dithering means each comprise two's complement processing means for

interpreting and processing said series of numbers having random characteristics in two's complement format.

5           14.    The apparatus of claim 12 wherein said digital filter has high-pass filter characteristics.

          15.    The apparatus of claim 14 wherein said filter means produces a spectrally shaped signal represented by said data stream that is attenuated at low frequencies with its energy concentrated in a band above 20 kHz.

10           16.    The apparatus of claim 15 wherein said spectrally shaped signal represented by said data stream has its energy concentrated in a band above 40 kHz.

15           17.    The apparatus of claim 14 wherein said series of numbers having random characteristics are processed in two's complement format.

          18.    The apparatus of claim 12 further comprising dithering control means for selectively adding said data stream to said signal values only when said series of signal values represents a signal amplitude below a predetermined threshold.

20           19.    The apparatus of claim 12 wherein said number generating means comprises a pseudo-random number generator.

25           20.    The apparatus of claim 19 wherein said pseudo-random number generator operates using a linear feedback shift register.

          21.    The apparatus of claim 12 wherein said digital signal processing circuit is a digital modulator circuit.

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22. The apparatus of claim 21 wherein said digital modulator circuit is part of a cable television receiver.

23. An apparatus for generating a spectrally shaped dither signal in a digital signal processing circuit that processes a series of signal values, comprising:

a number generating circuit that generates a series of numbers having random characteristics representing a signal;

a digital filter connected to said number generating circuit, said digital filter receiving said signal and producing a digital data stream representing a spectrally shaped signal; and

a summing circuit connected in a path of said series of signal values processed by the digital processing circuit and connected to said digital filter to receive said digital data stream and add said digital data stream to said series of signal values as a dither signal, thereby reducing idle tone generation.

24. The apparatus of claim 23 wherein said digital filter and said summing circuit interpret and process said series of numbers in two's complement format.

25. The apparatus of claim 23 wherein said digital filter has high-pass filter characteristics.

26. The apparatus of claim 25 wherein said digital filter produces a spectrally shaped signal represented by said data stream that is attenuated at low frequencies with its energy concentrated in a band above 20 kHz.

27. The apparatus of claim 26 wherein said spectrally shaped signal represented by said data stream has its energy concentrated in a band above 40 kHz.

28. The apparatus of claim 25 wherein said series of numbers having random characteristics are processed in two's complement format.

5 29. The apparatus of claim 23 further comprising a control circuit connected to said summing circuit that selectively actuates said summing circuit to add said data stream to said signal values only when said series of signal values represents a signal amplitude below a predetermined threshold.

10 30. The apparatus of claim 23 wherein said number generating circuit comprises a pseudo-random number generator.

31. The apparatus of claim 30 wherein said pseudo-random number generator operates using a linear feedback shift register.

15 32. The apparatus of claim 23 wherein said digital signal processing circuit is a digital modulator circuit.

33. The apparatus of claim 32 wherein said digital modulator circuit is part of a cable television receiver.

20 34. An improved digital modulator, comprising:  
a modulation circuit having a digital input that receives a series of values representing amplitudes of an input audio signal at a first level of precision and a digital signal processing circuit that quantizes the received  
25 values as a digital audio signal at a second level of precision lower than said first level of precision and generates an output representing said digital audio signal at said second level of precision;

a number generating circuit that generates a series of numbers having random characteristics representing a signal;

30 a digital filter with high pass characteristics connected to said number generating circuit to receive said signal and generate from said signal a digital dither data stream representing a spectrally shaped dither signal; and

a summing circuit connected to said digital signal processing circuit and to said digital filter to receive said digital dither data stream and provide said digital dither data stream to said digital signal processing circuit as a dither signal, thereby reducing idle tone generation when said input audio signal has low amplitude.